GENERAL INVESTIGATIONS RECONNAISSANCE STUDY
ILLINOIS RIVER, ECOSYSTEM RESTORATION

Section 905(b) Reconnaissance Analysis

1. STUDY AUTHORITY. The Illinois River Ecosystem Restoration Study is being carried out under the Corps of Engineers' General Investigations (GI) Program. The study was initiated pursuant to the provision of funds in the Energy and Water Development Appropriations Act, 1998. The study was authorized by Section 216 of the 1970 Flood Control Act, which reads:

> *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significant changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.*

Under this authority, an Initial Appraisal entitled, *Illinois Waterway System Ecosystem Restoration and Sedimentation, Illinois*, was prepared and approved in August 1996. The conclusions from this appraisal were that significant changes to the physical and economic conditions have occurred in the Illinois River since the navigation projects were built and that there is an opportunity for improving the quality of the environment. According to the Initial Appraisal,

> *…Substantial evidence exists indicating significant physical and economic changes have occurred in the study area. The significance of the resources and of the changes experienced indicates the necessity to further evaluate the sedimentation and degradation of the system and to identify ecosystem restoration efforts which could address issues. Based on this information, I recommend undertaking a reconnaissance study under Section 216 of the 1970 [FCA] authority.*

The Rock Island District of the U.S. Army Corps of Engineers received $100,000 in Federal Fiscal Year 1998 funds to conduct the reconnaissance phase of study and to develop a Project Study Plan for the feasibility phase.

2. STUDY PURPOSE. The purpose of this expedited reconnaissance study is to: (1) determine if there is a Federal interest consistent with Army policies, costs, benefits and environmental impacts in restoring fish and wildlife habitat; in reducing sedimentation impacts to the fish and wildlife habitat in the Illinois River; and in providing opportunities in water and related land resources projects and planning services within the Illinois River watershed; (2) prepare a Project Study Plan; and (3) assess the level of interest and support from non-Federal entities in cost-sharing for the feasibility phase and project construction. Specific attention was given to identifying opportunities of restoring degraded ecosystem structures and functions, including the ecosystem's hydrology and plant and animal communities, to a less degraded condition.

3. LOCATION OF STUDY AREA.

a. The Illinois River is part of the Illinois Waterway System. The Illinois Waterway System is comprised of the Chicago Sanitary Ship Canal, the Calumet Sag Channel, the Illinois-Michigan Canal, and the Chicago, Des Plaines, Kankakee and Illinois Rivers, and extends from Lake Michigan at Chicago, Illinois, to the Mississippi River at Grafton, Illinois, a distance of approximately 327 miles. The Illinois River, draining 40 percent of the State of Illinois, begins at approximate River Mile 272.0 of the Illinois Waterway System, just upstream of Dresden Island Lock and Dam.

b. The Congressional Districts located in the Illinois River Basin are the 11th (Gerald Weller), 14th (Dennis Hastert), 15th (Thomas Ewing), 17th (Lane Evans), 18th (Ray La Hood), 20th (John Shimkus), and the various Chicago Congressional Districts 1 through 10.

4. PRIOR STUDIES AND REPORTS. In conducting this analysis, a number of documents were consulted that were prepared by the U.S. Army Corps of Engineers, the Illinois Department of Natural Resources, the Illinois State Water Survey, the Tri-County Regional Planning Commission, The Nature Conservancy, the Heartland Water Resources Council, and the Office of the Lt. Governor of the State of Illinois. Some of the most notable studies and actions are:

a. ***Sediment Yield of Streams in Northern and Central Illinois***, Adams, J. Roger, *et al*., Illinois State Water Survey, December 1984. This report quantifies sediment yields in Illinois streams.

b. ***Peoria Lake Sediment Investigation***, prepared for the U.S. Army Corps of Engineers by the Illinois Department of Energy and Natural Resources, State Water Survey Division, January 1986. This report includes bathymetric profiles, results of core samples, and impacts of human activities on sedimentation. Potential solutions to sedimentation of Peoria Lake include controlling sediment input, managing in-lake sediment, hydraulically manipulating the Illinois River through Peoria Lake, creating artificial islands, selective dredging, and creating marshy areas.

c. ***Illinois River from Henry to Naples, Illinois, Peoria Lake and La Grange Pool, Illinois River Basin, March 1987***. U.S. Army Corps of Engineers Reconnaissance Study. This is a study authorized in Section 109 of Section 1304 of the Supplemental Appropriations Act that includes making a determination of the advisability of the preservation, enhancement, and rehabilitation of Peoria Lake in the vicinity of Peoria, Illinois.

d. ***Hydraulic Investigation for the Construction of Artificial Islands in Peoria Lake,*** July 1988, Illinois Department of Energy and Natural Resources, State Water Survey Division, Champaign, Illinois. This report discusses the best location for building islands in Upper and Lower Peoria Lakes. The models used determined effects of islands upon water surface elevations, sedimentation patterns, and velocities.

e. U.S. Army Corps of Engineers report, ***Upper Mississippi River System Environmental Management Program, Peoria Lake Enhancement***, published in July 1990. This technical publication, complete with National Environmental Policy Act documentation and engineering plans, was the authorizing document by which a 16-acre barrier island was created in Upper Peoria Lake to enhance migratory waterfowl habitat value and provide for more ideal fish spawning environment and establishment of mussel communities. Preliminary reports that monitor the success of the barrier island feature of the Peoria Lake Environmental Management Program project indicate that there is an increase in absolute numbers and diversity of waterbird species using the project site.

f. ***The Illinois River: Working for Our State***, Laurie McCarthy Talkington, Illinois State Water Survey, January 1991. This document includes descriptions of the past, current, and projected future conditions of the Illinois River. Specific portions related to this study include flora and fauna descriptions, the significance of its working role, and the many roles of the river. A significant portion of the report was used in describing the existing conditions herein.

g. ***Erosion and Sedimentation in the Illinois River Basin***, Demissie, Misganaw, *et al*., Illinois State Water Survey, June 1992. This report performed sediment yield calculations for Illinois River tributaries and used those relationships to construct an approximate sediment budget for the Illinois River Valley. The report also discusses the effect of changed crop practices upon sediment loads.

h. ***Source Monitoring and Evaluation of Sediment Inputs for Peoria Lake***, Bhowmik, Nani G., *et al.*, Illinois State Water Survey, February 1993. The objectives of this report were to determine the sediment sources to Peoria Lake and to evaluate sediment loads from local tributaries to determine best management practices for the tributaries. This report also estimated the sources of sediment in Peoria Lake and what percentages of sediment in the lake are from local tributaries or the Peoria Lake.

i. ***Heartland Riverfront Master Plan***, April 1994. This document describes existing and planned development of the riverfront and central business district in downtown Peoria, Illinois. The document and architectural drawings were prepared by Phillips Swager Associates, Architects; EDAW, Inc., Planners; Hammer, Siler, George Associates, Economists; and Farnsworth and Wylie, Engineers.

j. ***Section 216 Initial Appraisal, Illinois Waterway System Ecosystem Restoration and Sedimentation, Illinois***, U.S. Army Corps of Engineers, Rock Island District, August 1996. This document recommends further study of the Illinois Waterway ecosystem in light of changed physical and economic conditions since the 9-foot navigation channel was constructed.

k. Proposal by Mr. John C. Marlin, Waste Management and Research Center, to U.S. Department of Agriculture on ***Illinois River Characterization for Restoration and Beneficial Use of Sediment***, April 1997.

l. University of Illinois, Water Resources Center, ***Strategic Renewal of Large Floodplain Rivers***, ongoing research effort University of Illinois, Urbana, Illinois. This is a joint effort with the National Science Foundation and the U.S. Environmental Protection Agency. The work effort is to develop a restoration model for the La Grange Pool.

m. ***Restoration of Large River Ecosystems: Hydrologic and Hydraulic Analyses of La Grange Pool of the Illinois River***, Xia, R. and M. Demissie, 1997. Hydrology Division, Illinois State Water Survey, Champaign, November (Draft). This work effort is a hydrologic and hydraulic analysis of the La Grange Pool of the Illinois River.

n. ***Mackinaw River Watershed Management Plan***, The Nature Conservancy, June 1998. Provides a long-range plan for the 1,138-square-mile tributary of the Illinois River. The goal is to establish or restore 22,500 acres of wetlands.

5. SIGNIFICANT ONGOING ACTIONS. Several ongoing actions call for a collaborative effort among Federal, State, and local agencies to address water and related land resources within the Illinois River Basin. Four significant actions include:

a. ***Upper Mississippi River Illinois Waterway System Navigation Study*.** The study addresses the need for navigation improvements on the Upper Mississippi River (UMR) and the Illinois Waterway

(IWW) System. The study area includes 854 miles of the UMR, with 29 locks and dams, between Minneapolis-St. Paul and the mouth of the Ohio River, and 348 miles of the IWW, with 8 locks and dams, that connect the city of Chicago and the Great Lakes with the Mississippi River just upstream of the Melvin Price Lock and Dam. The study area lies within portions of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The system's principle problem is delays to commercial navigation traffic due to limited lockage capacity and increasing traffic. The reconnaissance studies completed for the UMR and IWW identified several locks in the study area with some of the highest average delays to commercial tows in the country. These delays continue to increase with traffic growth. Built in the 1930s, the navigation system was designed to accommodate 600-foot-long tows (except at Locks 19, 26, and 27). Today, with tows routinely 1,200 feet long, double lockages are necessary that take more time and result in higher costs. Looking into the future, there is potential for significant traffic delays on the UMR and IWW navigation system within the 50-year planning horizon, resulting in economic losses to the nation.

The feasibility phase of the study began on April 16, 1993. The Rock Island, St. Louis, St. Paul, and New Orleans Districts are investigating the feasibility of navigation improvements on the UMR and IWW. The study will formulate, evaluate, and compare various alternative plans comprised of small- and large-scale measures. Several examples of small-scale measures at lock sites include guidewall extensions with powered kevels, switchboats with guidewall extensions, mooring facilities, congestion tolls, and approach channel improvements. Examples of large-scale measures include various innovative lock designs for the construction of 600- or 1,200-foot locks at various locations at existing lock and dam sites. The alternative plans will be evaluated in consideration of completeness, effectiveness, efficiency, and acceptability.

The Navigation Study team is in the process of completing model testing, validation, and quality control review, and readying model inputs to initiate the final plan formulation process of the study. The Navigation Study team will commence this final formulation process in March 1999. During this phase, the study team will develop, evaluate, and compare several alternative plans and tentatively select a recommended plan. Upon selection of the recommended plan, the Navigation Study team will enter the final phase of the study which is documentation, internal review, and public review of the draft feasibility report and draft Environmental Impact Statement.

b. ***Integrated Management Plan for the Illinois River Watershed***, prepared by the Illinois River Strategy Team in cooperation with nearly 150 participants, chaired by Lt. Governor Bob Kustra, January 1997. The plan contains 34 recommendations divided into six sections: In the Corridor, Soil and Water Movement, Agricultural Practices, Economic Development, Local Action, and Education. This is a living document that outlines a plan for the Illinois River. It is also the catalyst for other actions. A copy of the *Integrated Management Plan* and the supporting Technical Report are attached (see Attachments 2 and 3, respectively).

c. ***State of Illinois Natural Resources Coordinating Council (NRCC).*** In 1994, Governor Jim Edgar's administration created the NRCC to address and coordinate issues between the State's natural resource and environmental agencies. The NRCC consists of the directors of eight Illinois State agencies, including the Environmental Protection Agency; the Pollution Control Board; and the Departments of Natural Resources, Agriculture, Public Health, Commerce and Community Affairs, Transportation, and Nuclear Safety.

The NRCC subsequently created several committees to address specific natural resource issues, including the Watershed Management Committee (WMC). The NRCC has charged the Committee with the following mission:

To serve in an ongoing capacity to coordinate watershed-based activities and Programs among the state's natural resource and environmental agencies. The Committee will also serve a liaison function to provide for the coordination of Federal and local involvement in watershed activities. An overall strategy will be developed that will include specific recommendations by the Committee, and review and endorsement by the Natural Resources Coordinating Council.

In 1998, the WMC was expanded to include additional State and Federal agencies as well as several non-governmental organizations. The Rock Island District has actively participated in the WMC.

In an effort to restore and protect watersheds within the state, the WMC has published *Unified Watershed Assessment and Watershed Restoration Priorities for Illinois (Draft).* The draft report and action plan list priority watersheds in the State of Illinois and call for coordination of activities and resources to focus on a collaborative effort to help protect and/or restore water resources. The Illinois River watershed and many tributary watersheds are listed as priority watersheds.

d. ***Conservation Reserve Enhancement Program (CREP).*** On March 30, 1998, Mr. Dan Glickman, U.S. Secretary of Agriculture, came to Peoria, Illinois, to announce a $400 million plus effort to improve the Illinois River with a Conservation Reserve Enhancement Program (CREP). In attendance were U.S. Senators Richard Durbin and Carole Moseley-Braun, U.S. Congressmen Ray La Hood and Lane Evans, and Jim Edgar, Governor of the State of Illinois. The CREP initiative will help preserve up to 100,000 acres of sensitive river basin land surrounding bordering Illinois River and tributaries. The CREP is very important in that it provides an unparalleled opportunity to help address long-term solutions to sedimentation and environmental restoration efforts. The CREP can address actions in the uplands while the Corps of Engineers can address sedimentation actions and restoration efforts in the waterways. This opportunity provides the vehicle to leverage actions and funds. An example of such an action could be utilizing the permanent easements and lands acquired by the CREP. These lands would be the basis for the Corps of Engineers' providing engineering solutions to restore the floodplains.

e. ***Illinois River Watershed Restoration Act.*** The State of Illinois is very proactive in addressing the restoration of the Illinois River. As an example, on July 16, 1997, Illinois Governor Jim Edgar signed the Illinois River Water Restoration Act. The legislative purposes of the Act are to: create a group of leaders representing agriculture, business, conservation, and the environment to encourage the implementation of efforts to restore the Illinois River Watershed in accordance with the recommendations of the *Integrated Management Plan for the Illinois River Watershed Technical Report* (see paragraph a. above and Attachment 3); work with local communities to develop projects and regional strategies; and make recommendations to appropriate State and Federal agencies.

The "group of leaders" that the Act authorizes is the Illinois River Coordinating Council. Membership to the Council includes the Lieutenant Governor of the State of Illinois and the heads of the following Illinois State agencies: the Department of Agriculture, the Department of Commerce and Community Affairs, the Illinois Environmental Protection Agency, the Department of Natural Resources, and the Department of Transportation. In addition, the Council includes one member representing Soil and Water Conservation Districts and six members representing local communities, not-for-profit organizations working to protect the Illinois River watershed, business, agriculture, recreation, conservation, and the environment. The Governor may, at his discretion, appoint individuals representing Federal agencies to serve as ex-officio, non-voting members. A representative from the Rock Island District of the U.S. Army Corps of Engineers has been participating, and will continue to participate, as a non-voting member.

There are six statutory directives to the Council, including: (1) periodically review activities and programs of State and Federal agencies that directly impact the Illinois River watershed; (2) work with communities and organizations to encourage partnerships that enhance awareness and capabilities to address watershed and water resource concerns and to encourage strategies that protect, restore, and expand critical habitats and soil conservation and water quality practices; (3) work with State and Federal agencies to optimize the expenditure of funds affecting the watershed; (4) advise State agencies on ways to better coordinate the expenditure of appropriated funds affecting the watershed; (5) encourage local communities to develop watershed management plans to address storm-water erosion, flooding, sedimentation, and pollution problems and encourage projects for the natural conveyance and storage of floodwaters, the enhancement of wildlife habitat and outdoor recreation opportunities, the recovery, management, and conservation of the Illinois River and its tributaries, the preservation of farmland, prairies, and forests, and the use of measurable economic development efforts that are compatible with the health of the watershed and the state; and (6) help identify possible sources of additional funding for watershed management practices.

6. PLAN FORMULATION.

a. General. A number of Federal, State and local agencies, academic institutions, and citizens' groups have expressed interest in the reconnaissance study and participated in the initial development and formulation of the 905(b) Reconnaissance Analysis. These interested parties and participation were outlined in paragraph 5, "Significant Ongoing Actions." Primary among the actions are the development and participation in the Illinois River Coordinating Council authorized by the Illinois River Watershed Restoration Act and the Corps of Engineers' participation in the development of the *Integrated Management Plan for the Illinois River Watershed.*

In addition to participating in various actions, the Rock Island District has conducted numerous site visits to the study area to meet with local representatives, identify problems and needs, and evaluate potential actions to be addressed in the reconnaissance study. Based upon extensive coordination with the non-Federal customer and other stakeholders interested in the restoration and environmental well being of the Illinois River Basin, the following project evaluation criteria were developed for the reconnaissance study phase:

- Likelihood of developing technologically feasible and cost-effective actions to address Corps participation and actions as identified in the *Integrated Management Plan for the Illinois River Watershed;*
- Demonstrated national, regional, and local significance of the ecological resources within the study area;
- Reasonable probability that identified actions and alternative projects will contribute significantly to improvement in the ecosystem of the basin and are within the authority of the Corps of Engineers, other Federal agencies, or the non-Federal customer to implement;
- Ability to demonstrate a clear linkage between implementation of a plan and measurable improvements in the ecosystem; and
- Reasonable assurance that a non-Federal sponsor will be identified who is capable and willing to participate in a cost-shared feasibility study.

b. <u>Identified Problems</u>.

(1). Existing Conditions.

(a). *General Description*. The Illinois River is either 270 or 327 miles long, and it may or may not be considered to lie entirely within the boundaries of Illinois. These discrepancies arise because the river has had several incarnations. Geographically, it begins at the point where the Des Plaines, Du Page, and Kankakee Rivers converge near the Will and Grundy County lines; that river flows for a distance of 270 miles, ultimately entering the Mississippi at Grafton, about 40 miles north of St. Louis.

The Illinois is a working river with a working title, the "Illinois Waterway." In that form it extends all the way to Lake Michigan through the Des Plaines and Chicago Rivers. With this added length, the Illinois Waterway spans 327 miles from Lake Michigan to its confluence with the Mississippi.

From its headwaters, whether they are considered to be at Lake Michigan or farther inland, the Illinois River winds southwest through northern Illinois. Along this stretch, known as the "upper Illinois," currents are swift because the river flows down a fairly steep incline through a narrow, young valley that was once occupied by the Mississippi River.

The upper river flows to Hennepin in Putnam County, where it encounters the "Great Bend." This point marks the beginning of the middle river. Here the Illinois turns southward and flows past Peoria to Beardstown in a gentle gradient through a broad, shallow valley 3 to 6 miles wide.

The banks along this stretch of the Illinois are lined with dozens of lakes and backwaters that were originally carved out of the land by erosion and deposition processes. When the river overflowed, its sediment-laden waters cut crevices through the riverbanks. As the waters escaped through these crevices, they created side channels, sloughs, swamps, and other backwater wetlands, so that the river valley resembled a boundless marsh. When dams were built in the river in the 19th century, many of these backwaters and wetlands were filled and formed as many as 300 long, narrow backwater or bottomland lakes.

In the 20th century, the natural sedimentation processes that formed the backwater wetlands have been altered and accelerated by human activities such as agriculture, levee building, and urbanization. These activities have set the stage for the very extinction of the wetlands and lakes along the middle river, which are now being filled with sediment. As of 1995, sedimentation had reduced their average depth to only a few feet.

The lower river, extending from Beardstown to Grafton, was once rich with backwaters, but levees erected early in our century adversely impacted the majority of the natural lakes and wetlands along this stretch. Thus, only about 53 backwater lakes now survive along the full length of the river, and the floodplain of the Illinois River is now little more than 200,000 acres, about half its size 100 years ago. Although the Illinois River Valley was once almost entirely wetlands, actual water surfaces now account for only 60 to 100 square miles (40,000 to 70,000 acres).

The Illinois River Basin encompasses some 30,000 square miles, covering 44 percent of the land area of the state and including more than a dozen tributaries of the main river. About 1,000 square miles of the watershed extend into Wisconsin with the upper portions of the Fox and Des Plaines Rivers, and another 3,200 square miles extend into Indiana with the Kankakee and Iroquois Rivers. The Illinois River Basin

includes 46 percent of the state's agricultural land, 28 percent of its forests, 37 percent of its surface waters and streams, and 95 percent of its urban areas.

(b). ***Flora and Fauna*****.** The Illinois River and its backwater lakes, wetlands, and bottomland forests include habitats that provide nesting, food, and cover for fish, waterfowl, and wildlife. The prehistoric river valley was once a paradise where plant and animal life flourished. Today's flora and fauna are but a remnant of these, but they still include some of the richest habitat in the Midwest, even some unique in North America.

- ***Vegetation***. Basic to the ecology of the river valley is the vegetation that grows in, alongside, and upland from the waters. The plant life of the Illinois Valley is best understood according to its physical relationships to the river and its backwaters: aquatic vegetation grows in the waters, moist-soil vegetation occurs alongside, and upland vegetation, mainly forest, occurs on the bottomlands away from the river. The life cycle of each is tied to the waters.

Aquatic Vegetation: Aquatic vegetation may live entirely beneath the water, it may emerge from the water, or it may float on the surface, such as the foliage of lotus or water lily. Different varieties of aquatic vegetation thrive at different depths. Those varieties requiring total submersion must have deeper water, while those that must be able to emerge above the waterline require shallow depths.

Aquatic plants are basic to the ecology of the Illinois River Valley and serve many functions. Their leaves and fruit provide food for waterfowl and habitat for plankton and small invertebrates—insect larvae, mollusks, crustaceans, and worms—on which fish and ducks feed. The leaves also provide protective shelter for spawning and young fish. In addition, the plants help cleanse the water of certain toxins, such as ammonia.

A century ago, the waters of the Illinois River Valley teemed with aquatic plants, but today only the most hardy varieties are generally found, such as river bulrush, marsh smartweed, pondweed, wild celery, coontail, and American lotus. These species are tolerant enough to adapt to fluctuating water levels, pollution, and turbidity.

River bulrush, the most common emergent aquatic plant in the Illinois Valley, provides nesting habitat for some species of ducks, as well as food and den materials for muskrats. Marsh smartweed, also an emergent variety, provides cover for migrating waterfowl and seeds to feed them. It is the preferred brood habitat for wood ducks and mallards, and it provides some food and housing for muskrats.

Sago pondweed, once the most important waterfowl food plant on the continent, is now relatively rare. It was killed off almost entirely by temporary high water levels in the 1950s and 1960s, although it has recently been found in isolated locations along the river. Curlyleaf pondweed, an underwater plant, was abundant in nearly all the backwater lakes as late as the 1950s. But like so many other varieties of aquatic vegetation, today it is found only in isolated beds. Wild celery, the preferred food of canvasback and ring-necked ducks, also nearly disappeared from the river valley in the 1950s and 1960s, and only remnants survive today.

Like all plants, aquatic varieties require clean, healthy water; sunlight for photosynthesis; and relatively undisturbed environments. The disappearance of most of the aquatic vegetation from the waters of the Illinois River Valley seems to be linked to pollution and fluctuating water levels, which stunt the growth of some varieties and force others to struggle to reach the water's surface. But just as important to the disappearance of aquatic vegetation is the turbidity caused by sedimentation, which inhibits photosynthesis. Moreover, suspended sediments settle only loosely to the lakebeds, creating soft bottoms in which aquatic plants cannot rake root.

Moist-Soil Vegetation: This type of vegetation grows on mudflats that occur naturally around the shores of backwater lakes. These plants, the most abundant form of vegetation in the Illinois River Valley, occupy some 31,000 acres of mudflats. Their seeds are the primary food source for as many as 35 different species of waterfowl, which either pluck them directly from the plants or pick them from the mud or shallow waters after the plants have dropped them. The seeds most favored are produced by arrowleaf, cocklebur, several species of millet and smartweed, nutgrasses, rice cutgrass, Spanish needles, teal grass, and water hemp.

The health and seed productivity of these moist-soil plants depend on a year-round cycle of specific water levels. The cycle begins in the spring when waterfowl eat the seeds left on the mudflats around the lakes. With plentiful spring rains, the river overflows and the lakes rise and cover their muddy banks. Light summer rain and low water levels from July to October cause the lakes to recede. As the mudflats dry in the sun, the seeds remaining in the mud germinate and grow. With the coming of early fall rains, the plants produce seed once again, the river makes the lake waters rise, and the mudflats are immersed under a shallow cover of water. This is the environment in which dabbling ducks feed during fall migrations.

Thus, water levels in the Illinois River and in the bottomland lakes determine the availability of both aquatic vegetation and moist-soil plant food for ducks. If water levels are low in the fall and mudflats are exposed, moist-soil plants cannot produce adequate seeds for the waterfowl. If the levels are too high in the fall and mudflats are too deeply submerged, the dabbling ducks will be unable to reach the seeds.

Upland Vegetation: The forests of the Illinois Valley occupy low-lying areas along the river known as "bottomlands," and the trees are classified according to their physical relationship to the river and its floodwaters. Thus, different species appear at different elevations and distances from the water and thrive in soils with varying moisture content.

Although the Illinois River Valley was once rich with verdant forests, today's bottomland forest consists of little more than narrow strips along the edges of the riverbanks and the mudflats surrounding the bottomland lakes. The most densely forested areas today are located around La Salle and Starved Rock, and in the Alton Pool, the river's southernmost section.

Black willows, cottonwoods, and soft maples are the most water-loving species of the bottomland forest. They can grow right up to the water's edge, overcoming smaller, more delicate moist-soil vegetation normally at home on the mudflats. Although they provide habitat for some forms of wildlife, these trees do not support a biologically diverse ecology. Because so few species thrive in this near-aquatic environment, they are at constant risk of eradication from a single disease, pest, or climatological impacts, including severe flooding or drought. This is due to the forest not being diverse in species.

Farther upland from the river and the lakes, the forest is dominated by mixed softwoods. The most prevalent species is silver maple, but American elm, swamp privet, red mulberry, box elder, green ash, sycamore, and river birch are also present, creating a diverse and biologically active forest ecology.

The upper floodplain terraces of the Illinois River Valley are characterized by a genuinely diverse mix of moderately flood-tolerant species of oak, hickory, maple, and walnut, locust, and hackberry trees, with a compliment of shrubs and small trees including persimmon, sugarberry, hawthorn, and dogwood.

(c). *Wildlife, Fish, and Waterfowl*.

- ***Wildlife*.** The forests, wetlands, and scrub-shrub environments of the Illinois River Valley are inhabited by about 50 different types of mammals, including many species of opossums, shrews, weasels, moles,

bats, rabbits, squirrels, beavers, raccoons, muskrats, minks, red and gray foxes, coyotes, and deer. Their habitats include subterranean dens burrowed at the water's edge, in the upland forest floor, or beneath hollowed trees. Some mammals nest in any of the valley's thick scrub-shrub environments not encroached upon by humans.

Although fewer species of mammals inhabit the forests and wetlands of the Illinois River Valley today than 100 years ago, wildlife populations in general are stable and healthy. Some species, such as raccoons and beavers, are as plentiful now as at any time in recent memory. Even white-tailed deer, which were hunted to extinction in the Illinois River Valley in the early part of this century, have thrived since their reintroduction in the 1930s.

Where specific populations are declining slightly, as is the case with cottontail rabbits and minks, weather extremes or loss of habitat to agricultural expansion are typically to blame. Bobcats and river otters are among the larger species now considered by the State to be "threatened," while white-tailed jackrabbits and some species of rats and bats are listed as "endangered."

- ***Fish.*** The Illinois was once among the most biologically productive rivers in the nation. In 1682 Henri de Tonty, a French explorer and companion to La Salle, wrote in his travel log that one catfish caught in the Illinois River served as supper for 22 men. As recently as the 1950s, the waters of the Illinois River Valley were counted among the great inland commercial and sport fisheries. Although this is no longer the case, the state as a whole remains one of the nation's top ten producers of freshwater fish.

The Illinois River is home to more than 100 fish species, and its side channels and backwater lakes serve as nurseries and spawning areas. Carp and carp-goldfish hybrids are most abundant, but other species common to the Illinois include gizzard shad, white bass, largemouth bass, bluegill, and black crappie. Channel catfish, buffalo, bullhead, sauger, and many other warm-water species also inhabit the river.

Around Chicago, in the upper reaches of the Illinois Waterway, most species diversity can be attributed to the accidental entrance of Lake Michigan fish into the waterway through the Chicago River. Because water quality is less than ideal between Chicago and the Great Bend, and because that stretch includes few backwaters for breeding and spawning, only the hardiest species can be found. Thus, carp are most plentiful throughout the upper river, except around Starved Rock, which offers more diverse habitats.

Although many fish in the upper river suffer from poor water quality, improving conditions since the 1970s have resulted in increased populations of largemouth bass and black bullheads and in the appearance of substantial numbers of white bass, especially around Starved Rock.

The middle river has historically been the most productive because of the excellent habitat in the backwater lakes and wetlands along its banks. But as the lakes fill with sediment and as aquatic vegetation is killed off, fish-food resources are diminished. Thus, rough species such as carp predominate here also.

The lower river, from Beardstown to Grafton, features about the same mix of fish species as the middle river, but populations are smaller. Even though water quality is better than in the middle river, fish populations are constrained because the lower river is channelized behind levees, and very few backwater habitats are accessible for breeding.

- ***Waterfowl.*** The Illinois Valley is also temporary home to hundreds of thousands of waterfowl that rest and feed among the backwaters during their spring and fall migrations. The Illinois River Valley is part of the Mississippi Flyway, the route followed by migratory waterfowl between Canada and the Gulf

Coast. As of 1983, about half of the floodplain of the Illinois River was appropriate for waterfowl habitat.

The backwater habitats of the Illinois Valley support approximately 20 species of waterfowl, about 95 percent ducks and 5 percent geese. Mallards are by far the most plentiful, accounting for more than three-quarters of the populations. The valley represents a special haven for wood ducks, which breed more abundantly among the backwater lakes of the Illinois River than anywhere else in the state or the entire nation.

Migrating waterfowl typically visit the Illinois River backwaters from 16 to 28 days each spring and fall, with an average stay of 21 days. Food resources are more plentiful in the fall, so populations are higher; mallards in particular feed until mid-December. The availability of food is the primary factor affecting the number of ducks and the length of their stay. For example, the surprising appearance of canvasback and ring-necked ducks at Peoria Lake from 1949 to 1953 seems to have coincided with the appearance of wild celery, one of their favorite foods. But if waterfowl do not find food soon after they arrive in the backwaters, they leave the area within one day and continue their migrations.

Mallards, pintails, green-winged teals, and some widgeons are known as “dabbling ducks” because they feed on the seeds of moist-soil plants in the shallow waters of inundated mudflats around the backwater lakes. Mallards supplement this diet with corn gleaned from harvested fields, while Canada geese and snow geese feed almost entirely in fields. Although these food sources have made it possible for hundreds of thousands of mallards to overwinter in the valley, the forage supply is declining steadily as more efficient harvesting techniques and equipment make less grain available. Fall plowing also sytmies forage opportunities for waterfowl, and new corn varieties are being developed for even cleaner harvest. Thus, mallards now rely more on the seeds of moist-soil plants that grow on mudflats.

“Diving ducks” find their food sources below water. Diving ducks and coots depend on a variety of aquatic plants, including coontail, American lotus, river bulrush, marsh smartweed, duck potato, sago and longleaf pondweed, and various species of duckweed. (Coots, not technically waterfowl, are classified as such because of their feeding behavior.) To supplement their diets of aquatic vegetation, ring-necked, canvasback, and ruddy ducks eat the small invertebrates, such as fingernail clams, insect larvae, snails, and worms, that inhabit the vegetation and the lake bottoms. Lesser scaup ducks depend almost exclusively on these underwater organisms for sustenance.

Because diving ducks pluck their food from deep waters, their numbers are not as severely affected by water-level fluctuations, as are dabbling duck populations. But diving ducks have been affected by the unexplained disappearance of fingernail clams from the Illinois River Valley in the 1950s. This catastrophe resulted in a dramatic decline in the numbers of diving ducks in the Illinois River backwaters and in the duration of their visits. Efforts to reintroduce fingernail clams since the 1950s have been unsuccessful and today these tiny mollusks are virtually nonexistent in the Illinois River Valley above Beardstown. Consequently, populations of lesser scaups and canvasbacks have dwindled, and their stays are now shorter. It is not uncommon to see birds arrive on the backwater lakes one night and depart the next.

Waterfowl populations declined even further in the 1960s when temporary high water levels eradicated much of the aquatic and moist-soil vegetation of the river valley. Overall duck populations using the Illinois River backwaters in 1982 were only 28 percent of 1948 numbers.

With the demise of their habitats and food resources in the last 40 years, many migratory waterfowl have abandoned the waters and backwaters of the Illinois. As a result, mallards now make up as much as 85 percent of the duck flight over the Illinois River Basin, probably because their feeding habits are so

flexible. They select from acorns and pecans plucked from flooded bottomlands, seeds from moist-soil and aquatic plants, and grain foraged from harvested fields.

To develop alternative food sources, private duck clubs and State and Federal agencies are establishing holding ponds and refuges with controlled water levels. These artificial impoundments offer deep waters with aquatic vegetation for diving ducks, as well as controlled waters and regularly occurring mudflats on which moist-soil plants are cultivated for dabbling ducks. Given the increasing shortages of natural food resources, these controlled water impoundments are becoming essential to maintaining populations of migratory waterfowl, and each year additional acreage is being brought under some degree of water-level control.

- ***Shorebirds.*** The backwaters of the Illinois also serve as habitat for 20 to 30 species of shorebirds and 15 species of gulls and terns. The cottonwoods and black willows along the middle and lower river and its wetlands are host to various types of herons, egrets, plovers, sandpipers, and other migrating wading shorebirds, as well as gulls and terns.

Wading shorebirds represent the farthest ranging visitors to the Illinois River Valley, traveling between the Arctic and Chile and Argentina yearly. The river valley provides virtually the only appropriate environment for them in the entire Midwest. Their behaviors are diverse: they wade in the wetlands and feed on invertebrates and small fish in the shallow waters and marshes, as well as on insects in adjacent woods and fields. Only two species stay to nest in the forests.

Although their numbers appear to be stable or even improving slightly, wading shorebird populations have never been large. For this reason, egrets, herons, cormorants, ospreys, eagles, hawks, falcons, and terns have been listed by the State as "endangered." An overall nationwide population decline in our century has been attributed to timber cutting and other loss of habitat, illegal hunting, pollution, and human disturbance.

- Benthic Organisms. Basic to most life forms in and along the Illinois River are the benthic species, the microscopic, invertebrate animals that inhabit the bottom sediments and aquatic vegetation of the river and the backwater lakes. Many different clean-water species of insect larvae and tiny mollusks serve as food for higher animals such as fish and ducks and thus form an important part of the food chain. Other benthic species, such as leeches and moss animals, are important to the health of the waters because they filter algae, bacteria, and organic matter.

A very desirable mix of clean-water species once dominated the benthic life forms in the river, according to studies conducted between 1913 and 1915. But much of the diversity of the benthic species in the Illinois River has been diminished, so that only the most hardy species—not necessarily the most valuable—still survive. Studies of the river between La Salle and Beardstown in 1964 and 1965 showed that the most prevalent bottom fauna were pollution worms of the family Tubificidae, which are poor food for fish and ducks. Where 4.4 pollution tolerant worm species were collected per square yard in 1915 at Lake Matanzas, below Havana, more than 11,000 pollution tolerant worm species were found per square yard in 1953.

Fingernail clams have been the most important benthic species to disappear. This primary food source for bottom-feeding fish and diving ducks was plentiful throughout the river and its bottomland lakes until 1954. Then the clams abruptly disappeared, and today only isolated populations can be found in tributaries and backwater lakes. Many attempts have been made to recolonize the river, but none have proved successful. Researchers are still trying to identify the toxic substance that is discouraging fingernail clams in the middle and lower river and actually preventing them from repopulating the upper river.

(d). ***Sedimentation*****.** Paramount among the current issues surrounding the Illinois River is sedimentation. Much of the sediment load is the result of natural conditions such as the river's overall low slope, but much of it is also the result of human alterations to the lands and streams of the river basin. Nonetheless, sedimentation affects the navigability of the river and is filling the backwater lakes at a rate that threatens their very survival. By making waters turbid and murky, suspended sediments inhibit photosynthesis for aquatic vegetation. As sediments settle out of suspension, they create a soft riverbed and lakebeds in which aquatic vegetation cannot take root.

By the 19th century, natural sedimentation processes had reduced the river's drainage area and constricted the flows of the upper river into a single, rather narrow channel. Below the Great Bend the river flowed slowly through gently rolling terrain. Broader and shallower than the upper river, it was lined with sidestreams, wetlands, and narrow lakes with vast, low floodplains beyond. Overflows were accommodated by the backwaters and side channels, and they in turn released their own sediment-filled overflows into the floodplains.

The Illinois River Valley is especially subject to sedimentation because the tributary streams flow downward into the river, descending many times faster than the river itself. The slope of the Spoon River, for instance, drops at the rate of 1 to 3 feet per mile, while the slope of the Illinois at the mouth of the Spoon River is only 0.12 to 2 feet per mile. As the fast-flowing sediment-laden waters of the tributaries enter the slower flowing river, sediments drop out of the suspension to form alluvial fans and deltas near the mouths of those tributaries. Swift flows then cut the narrow, shallow crevices that became side channels and ultimately the narrow backwater lakes.

While sedimentation is a problem along the full length of the Illinois, the swifter waters above the Big Bend help keep sediments suspended. But with the transition to a gentler slope in the middle and lower river, the waters flow more slowly, and velocities are not sufficient to keep sediments in suspension. Thus, the middle and lower river, where most of the backwater lakes were originally concentrated, is more susceptible.

Natural processes and gentler landscape of the middle and lower river have made it shallow and vulnerable to sedimentation, and the locks and dams have made its flows very sluggish. In effect, the pools between the dams are each separate, riverine lakes with slow currents and broad reaches—as vulnerable to sedimentation as any lake would be. Thus, today's Illinois River is even less capable of accommodating the sediments delivered by its tributary streams.

The Corps of Engineers routinely dredges portions of the river to remove excess bottom sediments and keep the navigation channel open. Some sections are dredged yearly, others less frequently. Sections at the mouths of tributaries must be dredged very frequently, and continual dredging operations are necessarily in the Chicago area to keep the waterways open.

Intensive agricultural development in the Illinois River Valley, particularly along the middle and lower river, has complicated the naturally occurring sedimentation by transforming the once rock-hard prairie floor into rich, loose soil. Since the 1920s, intensive row-crop agriculture, particularly soybean cultivation, has left the soil bare and vulnerable to erosion many months each year. Between 1945 and 1976, row-crop land in the Illinois River Basin increased by 67 percent, most of which was planted to soybeans. Sedimentation is further exacerbated by the practice of fall mold-board plowing after harvest.

The Illinois Environmental Protection Agency estimated in 1982 that more than 26 million tons of soil erode from the Illinois River Basin each year. Of these, about 11 million tons are transported to the

Mississippi, leaving about 15 million tons that are typically washed or blown into tributary streams in the Illinois Valley.

Most of the small tributary streams of Illinois have now been channelized and straightened to provide flood control, to accommodate roads and bridges, and to conform to agricultural land use. More than half of all the streams in eight counties that line the Illinois River have been channelized. Moreover, the great marshes that once impeded the movement of streamwaters are now largely gone. Together these conditions accelerate streamflows, which in turn accelerate the rate of farmland runoff. Faster farmland runoff increases streamwater velocities, and these in turn encourage streambank erosion. All these conditions have dramatically increased sedimentation in the river and subsequently in the backwater lakes.

According to preliminary results of the 1987 Natural Resources Inventory conducted by the Illinois Department of Agriculture, approximately 52 percent of the state's croplands are in need of conservation practices to control erosion. The most common practices include reduced tillage, contour farming, terracing, grassed waterways, and streambank stabilization. Between 1982 and 1987, these techniques reduced soil erosion in Illinois from about 7 tons per acre per year to about 5 tons per acre, still well above desirable levels. Federal and State agencies are actively promoting several erosion reduction programs and practices in an effort to solve the problem.

But rural agrarian conditions are not alone in contributing to the sedimentation of the waters of the Illinois River Basin. Landscape wastes and sediment also originate in storm runoff from road construction sites, paved urban areas, and urban construction sites where vegetation has been stripped away.

Sedimentation and erosion are now recognized as the number one problems facing the State of Illinois' wetland resources. Without drastic control measures, the aquatic and wildlife ecology of the entire Illinois River system will decline irretrievably.

(2). Expected Future Conditions. It should be realized that there have been terrific improvements to the overall health of the Illinois River system in the past few decades. This has been primarily due to progressively improving water quality, based on individual and cooperative monitoring efforts by State and local agencies such as the Illinois Environmental Protection Agency, the Metropolitan Water Reclamation District of Greater Chicago, the Illinois State Water Survey and Natural History Survey, and the Illinois Department of Conservation. Many of their efforts have concentrated on the water quality issues of the upper Illinois River. Reports concur that the waters of the Illinois, as well as the sediments, all showed considerable improvement between 1972 and 1979. Statewide, the percentages of waters ranked "poor" declined, while those ranked "good" increased. More extensive improvements were reported in 1982, and 1990 figures showed that only a small portion of the Illinois Waterway remains in "poor" condition. In fact, concentrations of total suspended solids and harmful substances such as dissolved barium, manganese, and boron all declined on the upper Illinois and Des Plaines Rivers between 1977 and 1989.

While water quality is not a primary Corps of Engineers mission per se, water quality does have direct effects on fish and wildlife habitat and it is expected that water quality and its associated effects will continue to improve due to increased water treatment and local actions. Only recently the fish populations have shown improvements and increases in the main river channel.

However, despite the improvements in water quality, aquatic vegetation has not fared well along the upper Illinois either. The last coontail, longleaf and sago pondweeds, and wild celery have all but disappeared from the Starved Rock pool. Despite clearer waters along many stretches of the river, efforts to rejuvenate various species are as yet isolated. While the reasons for the extreme decline of aquatic

vegetation in and along the Illinois River are not yet fully understood, they may be attributed to various combinations of water level fluctuations, resulting in sedimentation and turbidity, and this condition will continue into the future.

The river's backwaters have also not fared as well. Since the 1950s these shallow, serene waters have suffered from the mounting pressures of sedimentation, which seems to be introducing oxygen-consuming toxic sediments and organic contamination. As a result, backwater habitats continue to decline, and fish populations have not improved as markedly as they have in the main stem of the river.

Fish populations are most successful in the backwaters if: (1) the lake is closely connected to the river, ensuring adequate depth; (2) inflow to the lake comes from sources other than the river, ensuring good water quality; (3) the lake bottom is sufficiently stable, ensuring clear water in which fish can feed, breed, and build nests by sight, and in which aquatic vegetation can grow; and (4) food and aquatic vegetation are indeed available. It is expected that the without project condition will continue to allow sedimentation and the filling of backwaters. This will decrease the amount of available habitat if nothing is done.

Just as the loss of the Illinois River Valley's aquatic vegetation, filling of backwaters, and loss of microinvertebrates have affected fish populations, so too has it affected migrating waterfowl populations. The crustaceans and aquatic insects that live among the plants, as well as the plants themselves, form the major part of the diets of several species of ducks.

Diving ducks in particular have been drastically affected by the loss of food supplies, and increasingly fewer birds are using the river valley as a migratory stop. Peoria Lake, once the scene of the greatest autumnal concentration of diving ducks in Illinois, now attracts relatively few of them.

The loss of food supplies, particularly fingernail clams in the 1950s, caused major declines among lesser scaup, ring-necked, canvasback, and ruddy duck populations. The tiny mollusks had once constituted a significant portion of the diets of these diving ducks, while aquatic and moist-soil vegetation was used as a supplement. With the loss of both the fingernail clams and the aquatic vegetation, many diving duck species shifted their migration path to the Mississippi Valley. At the same time, high water levels that submerged mudflats along the middle river's backwaters during the 1940s and 1960s forced thousands of dabbling ducks and species such as widgeon and gadwall to leave the valley in search of moist-soil vegetation elsewhere.

Resources for migratory waterfowl have been destroyed by a combination of problems: sedimentation; urban, industrial, agricultural, and domestic pollution; and water-level fluctuations. All of these factors affect habitat, beginning with those organisms at the base of the food chain. Until these conditions are reversed substantially, it is unlikely that the Illinois River will attract significantly larger populations of migratory waterfowl or that all the waters will be suitable for further development of aquatic habitat for fish.

(3). Problems and Opportunities. The principal focus of the reconnaissance study is to identify opportunities for restoration of degraded ecosystem structures and functions, including the ecosystem's hydrology, plant, fish and wildlife communities to a less degraded condition. Primary emphasis is given to identifying potential restoration measures involving modifications of the hydrologic regime to restore the study area.

Potential opportunities that could be addressed in a feasibility study for implementation by the Corps of Engineers or in collaboration with the non-Federal sponsor and other Federal and local agencies are listed below in "Alternative Plans and Actions Considered." This list has been compiled through coordination with the Illinois Department of Natural Resources, the Office of the Lieutenant Governor of the State of

Illinois, and various State and local agencies and citizens in the study area. The specific actions are also listed in *The Illinois River: Working for Our State* and the *Integrated Management Plan for the Illinois River Watershed*. These publications are referenced in paragraphs 4 and 5, respectively.

c. Alternative Plans and Actions Considered. In order to address the restoration of the Illinois River, it must be a collaborative effort with a variety of State, Federal, and local stakeholders who are concerned about or charged with the protection and restoration of the Illinois River resource. Potential actions and plans to address the problems and opportunities could include, but are not limited to, the following:

- Implement backwater lake and side channel sediment management measures at selected locations.
- Assess the feasibility of implementing a temporary drawdown in conjunction with scheduled maintenance of the navigation system to dry out and compact deposited sediments.
- Investigate, assess and propose the implementation of regional strategies to protect, restore, and expand critical habitats through restoration of public lands, developing public/private partnerships, management agreements and technical assistance. This action would be a collaborative effort with other Federal, State, local, and non-government organizations, and private individuals.
- Investigate and determine the extent of shoreline erosion on the Illinois River and pursue recommended controls or remedies accordingly.
- Identify the causes of unnatural and natural water level fluctuations; disseminate results and implement solutions as appropriate.
- Investigate beneficial use of sediments through options for use of dredged materials.
- Establish water level management programs throughout the watershed for sediment management, waterbanking, and flood crest reduction.
- Stabilize unstable streams in rural and urban areas, particularly streams where the rate or magnitude of erosion yields abrupt or progressive changes in location, gradients, or pattern because of natural or human-induced changes.
- Improve monitoring of water and sediment of Illinois streams.
- Create wetlands.
- Dredge selected backwaters, side channels, and the mouths of tributary streams that enter lakes to remove sediment buildup and create backwater habitats.
- Construct dikes, levees, and pumping stations to keep silt-laden waters out of prime habitat areas and to control water levels in moist-soil environments.
- Build islands to create habitat for aquatic plants and wildlife.
- Open or close side channels to maintain the flow of water to these channels and backwaters.
- Develop aeration and water control systems to improve habitat quality.
- Investigate the cause and effect of the hydrologic cycle and make projections into the future. In addition, develop strategies to mitigate potential detrimental effects.
- Develop models and actions to ameliorate tributary sedimentation.

d. <u>Valuation of Plan to Establish a Federal Interest</u>. In order to proceed from the Reconnaissance Phase to the Feasibility Phase and on to construction of a project, it is necessary for the 905(b) Analysis **to identify only one potential project that is cost effective and in the Federal interest. Therefore, it should be realized that out of the list of "Alternative Plans and Actions Considered," only one alternative needs to be carried forward for this analysis.** The remainder of the Alternative Plans and Actions Considered can be addressed in developing a Project Study Plan (PSP) in coordination with our non-Federal sponsor. Therefore, for the purpose of this analysis, protecting and restoring a backwater lake will be examined.

- *<u>Dredging Selected Backwaters, Side Channels, and the Mouths of Tributary Streams that Enter Lakes to Remove Sediment Buildup and Create Backwater Habitats</u>*. Sediment deposition continues along the entire length of the river and its backwater lakes without significant interruption, threatening every life form. Aquatic vegetation is particularly vulnerable. Sediment consumes oxygen supplies and creates turbid waters that prevent photosynthesis and flocculent, loose lake bottoms in which plants cannot root. Thus, the invertebrates at the base of the food chain lose their habitat resources as well. Because delicate gills are physically abused by sediment, bottom-feeding carp and shad now tend to proliferate in the turbid waters, while more desirable species are eliminated, particularly those dependent on clear water for spawning and feeding.

In an attempt to measure the capacity losses of some of the most seriously endangered backwater lakes, their 1985 capacities were compared to measurements taken early in the century. Muscooten Bay showed a 100 percent loss and has virtually disappeared. Patterson Bay had experienced a 90 percent loss, Sawmill Lake 93 percent, Huse Slough 91 percent, and Weis Lake 86 percent.

Every backwater lake along the Illinois River has suffered a similar fate. Many have been reduced to shallow wetlands, and losses in water surface area now amount to more than 20,000 acres, leaving fewer than 70,000 acres of lake surface. According to studies conducted from 1976 through 1979, the average depth of bottomland lakes in the Illinois Valley was only 2 feet. The lakes in the La Grange Pool along the lower Illinois River averaged only 1.8 feet in depth. Many are so shallow that they are often completely devoid of oxygen in the summer and freeze solid in the winter, seriously threatening the viability of fish populations.

- *<u>Dredging and Creating Islands for Weis Lake or Other Backwater Areas</u>*. According to studies by the Illinois State Water Survey, the islands, created from dredged material, would reduce the wave action that resuspends bottom sediments. Increased flow velocities around the islands would help prevent sediment deposition. The resulting reduction in turbidity and improved water quality would increase chances for the survival of aquatic vegetation and invertebrate food resources for fish and waterfowl, and would also help recreational opportunities.

The degraded backwater areas could be constructed to conform to more native habitat conditions such that the planting of trees and grasses and other bioengineering activities on the island would increase the reliable food production and nesting area for waterfowl, neotropical migrants, and a myriad of other species. Bioengineering enhancement on the shore of the island would increase the diversity and total area of submergent and emergent vegetation to create an "edge" effect for various wildlife. Additional habitat value-based restoration would result from new side channel aquatic habitat areas, which would provide deep water for numerous over-wintering fish species.

Engineering activities utilizing dredged material to restore or create an island or islands in the lake would replace the more plentiful shallow water habitat now located there with more desirable deep water and terrestrial island habitat. As an example, experience with the Environmental Management Program (EMP) shows that three "units" of the lake's shallow water habitat in the form of dredged sediment are

needed to create a minimum of one "unit" of terrestrial habitat built upon one "unit" of shallow water habitat. The dredging process would leave behind three units of deepwater habitat. The island creation process thus results in a tradeoff that changes four units of relatively lesser value shallow water habitat into four units of a more desirable habitat, three units of deep water and one unit of terrestrial habitat. Depending upon the area dredged and the site(s) selected for construction actions (such as an island or series of islands created), the restoration gained from the project could provide for greater diversity and quantitative increases to the region's aquatic habitat and increase the value of the ecological resources in the area.

We can estimate from Corps EMP projects that the cost to create one acre of deepwater habitat (aquatic) or one acre of nesting bird habitat (terrestrial) is in the neighborhood of $50,000. When project construction is completed and monitoring has begun, we may then consider measuring, after a period of time, what has developed.

One way to "measure" habitat is with the Habitat Unit (HU), which we get from using the Habitat Evaluation Procedures, or HEP. In HEP, the HU is equal to habitat **quantity** (area) multiplied by habitat **quality**. In this case, quality is expressed in the form of a Habitat Suitability Index or HSI. This index varies from zero (0) to one (1) and indicates how suitable we have determined the habitat to be for a selected species when compared to that species' *optimum* habitat. If the HSI model determines that we have developed 100 percent optimum habitat for a chosen species, then our HSI value is 1 for that species.

If $50,000 is spent to develop the 1-acre habitat as stated previously, then we could assume that our 1-acre habitat has a value of $50,000 as related to the one selected target species. The cost to create an acre of a particular habitat type can be measured. However, the number of species that will eventually utilize that acre of created habitat and the quality of habitat that develops over time on any created acre of habitat are difficult to ascertain. This estimate is to build an island or set of islands. Dredging to create deepwater habitat would be less. The one thing that can be stated is that experience with the EMP program shows that the expenditures will result in quantitative net increases in fish and wildlife habitat units for the study area.

While the location, size, and volume of sediment used will be determined in the next phase of study, for purposes of estimating values and costs, it is probable that 6.6 million tons of sediment would be excavated to create deepwater habitat and some of the excavated material would be used for building the island(s). The approximate cost of construction, including Engineering and Design, Construction Management, and Project Management, is approximately $45 million, as shown below.

Preliminary Cost Estimate

Construction Costs for Islands and Deepening Areas in the Backwaters	$37,700,000
Engineering and Design	2,000,000
Planning and Real Estate Costs	900,000
Construction Management	750,000
Contracting	150,000
Program and Project Management	500,000
Contingencies	3,000,000
Total	$45,000,000

As stated before, this is an **example** of a proposed project. **The actual costs and extent of any project would be fully scoped in partnership with the State of Illinois and developed in the feasibility phase of the study process and could include any or all of the items listed in paragraph 6.c., *Alternative Plans and Actions Considered*. The Corps of Engineers and the State of Illinois also realize that given the severe loss of depth in so many backwater lakes, the expense of dredging, and the high return rates of sedimentation, it may be economically feasible to re-create deepwater environments only in selected areas. Again, these areas will be identified in the Feasibility Phase of the study process in cooperation with our customer.**

The BIG opportunity of this study is that the Corps of Engineers, in partnership with the State of Illinois and other Federal agencies, can begin to address sedimentation and the effects to backwaters by a "system approach." This opportunity is possible due to agricultural engineering; the implementation of the CREP; sanitary management practices which are now beginning to address the problems of runoff and soil erosion; the expansion and re-establishment of floodplains; and the reclamation and stabilization of the backwaters, mudflats, and wetlands. There is a consensus among resource agencies that with a collaborative effort, a significant amount of floodplains and backwaters can be restored, along with their natural habitats and recreational value.

7. FEDERAL INTEREST. Ecosystem restoration projects are defined as high priority outputs in the Administration's budget policy. Within the Civil Works program, priority is given to restoration projects that restore degraded ecosystem structures and functions, including the ecosystem's hydrology, plant and animal communities, to a less degraded condition. The principal problem impeding the restoration of aquatic and associated fish and wildlife habitat in the Illinois River Basin is the loss of backwaters, changed hydrologic regimes and water fluctuations, and other impacts upon the system caused by human activity. Ameliorating these problems within the watershed is a critical need that is within the Federal interest and appropriate for Corps of Engineers involvement.

Accordingly, the selected restoration efforts identified during the reconnaissance study and in the *Integrated Management Plan for the Illinois River Watershed* are consistent with Federal law, regulation, and policy. No adverse environmental impacts are anticipated from any of the proposed actions. The preliminary analysis conducted during the reconnaissance phase indicates that the ecological benefits of restoration activities will exceed project costs, that restoration measures are technologically feasible, and that they can be accomplished collaboratively with other State, Federal, and local entities in a cost-effective and efficient manner.

8. PRELIMINARY FINANCIAL ANALYSIS. The Illinois Department of Natural Resources has agreed to act as the non-Federal cost-sharing partner in the environmental restoration feasibility study for this project. The Illinois Department of Natural Resources has indicated by letter of intent, dated July 15, 1996, that it understands the feasibility and construction cost-sharing responsibilities and is willing to enter into negotiations for the feasibility phase of the investigation. The sponsor is aware that it will be responsible for all lands, easements, rights-of-way, relocations, and disposal areas of the project (LERRD), plus a cash contribution of a minimum of 5 percent of the total project costs. In the event that the LERRD costs plus 5 percent of total project costs do not equal at least 35 percent of total project costs, the non-Federal sponsor is aware that they must contribute additional cash to equal 35 percent. The non-Federal sponsor is also aware that it will be responsible for operating and maintaining the project at 100 percent non-Federal expense upon completion of construction. A copy of the Letter of Intent is included as Attachment 4.

9. POTENTIAL ISSUES AFFECTING INITIATION OF FEASIBILITY PHASE. Consensus of the resource management agency project participants, the non-Federal sponsor, and the Corps of Engineers has been reached to pursue activities to restore the ecosystem of the Illinois River Basin. This

consensus manifests with the coordination that has been done in developing the *Integrated Management Plan for the Illinois River Watershed* and the passage of the Illinois River Watershed Restoration Act. In addition, there is ongoing coordination and encouragement from the Illinois River Coordinating Council.

10. PROJECT AREA MAP. The project area map is included as Attachment 1.

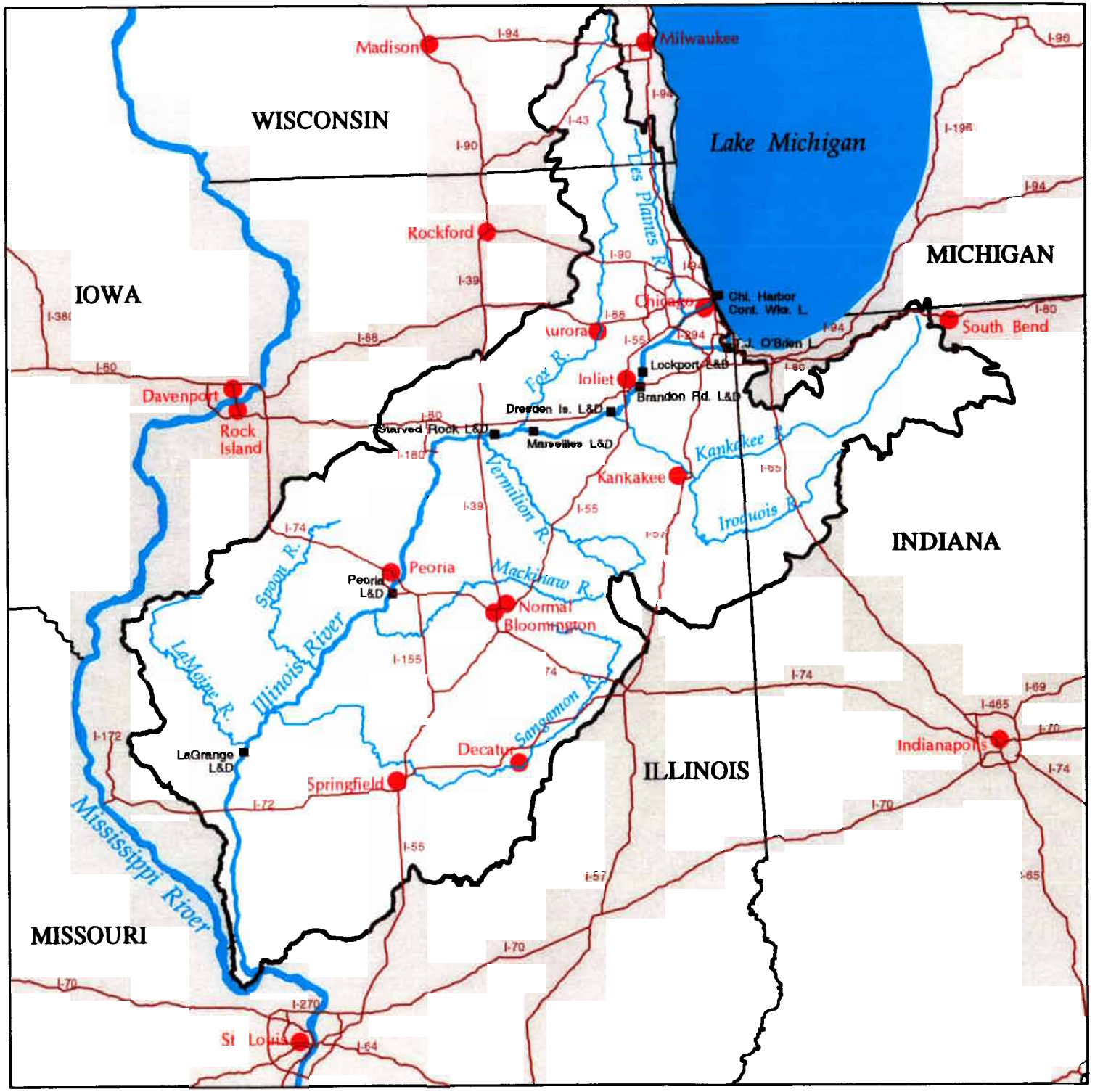
11. RECOMMENDATIONS. I hereby recommend that this Section 905(b) Reconnaissance Analysis be approved, that permission be given to develop the Project Study Plan, and that negotiation of the Feasibility Cost-Sharing Agreement with the State of Illinois begin.

1/28/99
(Date)

James V. Mudd
Colonel, U.S. Army
District Engineer

Attachments:
1. Project Location Map
2. Integrated Management Plan for the Illinois River Watershed
3. Technical Report
4. ILDNR Letter of Intent

Illinois River Drainage Basin



- Illinois River Drainage Basin
- Illinois Waterway Locks & Dams
- Major Cities
- Interstate Highways
- Rivers & Lake

25 0 25 50 Miles

25 0 25 50 75 Kilometers

N W E S

US Army Corps of Engineers
Rock Island District

Attach 1

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ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES

524 South Second Street, Springfield 62701-1787

Jim Edgar, Governor ● Brent Manning, Director

July 15, 1996

Colonel Charles S. Cox
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Cox:

The State of Illinois, Department of Natural Resources wishes to express their support for and willingness to participate with the U.S. Army Corps of Engineers in the Illinois Waterway System Ecosystem Restoration and Sedimentation Reconnaissance Study.

Under the Corps basin study process, I understand that this is a two phase study process for ecosystem restoration and recovery and that the reconnaissance phase would be paid for in total by the Corps. However, in subsequent phases (feasibility, design/engineering, and construction phases) non-federal cost-sharing must be provided by the State of Illinois in order to complete this Study. Should the initial reconnaissance phase study indicate that additional studies are warranted and needed to investigate the problems and solutions in greater detail and if economically and environmentally feasible structural measures are identified, the State of Illinois, Department of Natural Resources will give serious consideration to providing all or a portion of the required non-federal cost-share.

We support the initiation of a reconnaissance study and look forward to assisting the Corps of Engineers in completing its Illinois Waterway System Ecosystem Restoration and Sedimentation Reconnaissance Study.

Sincerely,

Brent Manning
Director

BM:hh

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Effective July 1, 1995, the Illinois Department of Natural Resources was created through the consolidation of the Illinois Department of Conservation, Department of Mines and Minerals, Abandoned Mined Lands Reclamation Council, the Department of Transportation's Division of Water Resources, and the Illinois State Museum and Scientific Surveys from the Illinois Department of Energy and Natural Resources.

Attach 4